MITCHELL'S SCREW PILE.

INSTITUTION OF CIVIL ENGINEERS.

On the 22nd ult., the president in the chair, the paper read was by Mr. A. Mitchell, "On Submarine Foundations; particularly the Screw Pile and Moorings." Considering that the entire subjects of the various sorts of piling, of solid stone foundations, of cofferdams, of masses of concrete, and the numerous modes adopted by ingenious men for overcoming local difficulties, would occupy too much time, and scarcely possess novelty, the author restricted himself almost entirely to the description of the works executed by him with the screw pile, as that had been chiefly employed for supporting structures on loose sand, or mud banks wholly or partially covered by the sea, where it had been previously considered very hazardous, if not impracticable, to erect any permanent edifice.

The origin of the screw pile was the screw mooring, which was designed for the purpose of obtaining, for an especial purpose, a greater holding power than was possessed by either the ordinary pile, or any of the usual mooring anchors or blocks, of however large dimensions. It was proved by experiment, that if a screw, with a broad spiral flange, were fixed upon a spindle, and forcibly propelled by rotary motion to a certain depth into the ground, an enormous force would be required to abstract it by direct tension, and that the power employed must be sufficient to drag up a mass of the form of the frustrum of a cone reversed, the base being at the surface of the ground, and the section of the apex being equal to the diameter of the screw. The extent of the resisting mass must of course depend upon the natural tenacity of the soil; even in this reasoning it must be evident that a vertical force was calculated upon, but as practically that seldom or ever occurred, the angle of tension and the curve of the buoy cable again gave the moorings greater power. This was found to be correct in practice, and the applications of these moorings became very extensive. An arrangement was made with the port of Newcastle-on-Tyne, by which, for the sum of 2,500*l.*, the right of fixing the moorings in the Tyne was given, and Mr. Brookes, the engineer, showed that last year, whilst in the neighbouring port damage was done to the shipping to the extent of nearly 30,000*l.*, no injury was sustained in the Tyne, entirely owing to the sound holding of Mitchell's screw pile moorings.

It naturally occurred to Mr. Mitchell that the same means of resistance to downward pressure might be used, and he proposed to apply it for the foundations of lighthouses, beacons, and other structures, which, for maritime purposes, it might be desirable to place upon sand and mud banks where hitherto it had been considered impracticable to place any permanent edifices. In the year 1838 a plan for a structure of this nature for a lighthouse on the Maplin sand, at the mouth of the Thames, was laid before the corporation of the Trinity-house, supported by the opinion of Mr. James Walker, their engineer. The nine iron piles, 5 inches in diameter, with screws 4 feet in diameter, were accordingly driven 22 feet deep into the mud, and, with proper precaution, they were allowed to stand for two years before any edifice was placed upon them. The lighthouse was subsequently constructed, and, as was testified by Mr. Walker, had stood perfectly until the present time. Pending the probation, it was determined to erect a lighthouse to point out the entrance to the harbour of Fleetwood-on-Wyre; and under the advice of Captain Denham, R.N., the screw piles were adopted. The spot fixed on was the point of a bank of loose sand, about two miles from the shore. Screw iron piles, with screws of 3 feet in diameter, were forced about 16 feet into the bank, and upon them timber supports, 48 feet in vertical height, were fixed to carry the house and lanthern. This structure was completed in six months, and it was said had never required any repairs to the present time.

A project was started by the Earl of Courtown in the year 1847, for adding to the length of the pier at the harbour of Courtown, on the coast of Wexford, which had proved an entire failure, from the channel between the solid pier being continually choked up with sand. Iron piles, with screws of 2 feet diameter, to be driven from 11 feet to 15 feet into the sand, and blue clay, were decided to be used in order to form an open jetty, through which the sand could be washed by the current; and the platform could be used for loading and discharging the shipping. The surface was so heavy on the coast that the usual barges, or floating rafts, could not be used for putting the piles down, so a plan was designed by Messrs. Mitchell for projecting a stage forward from the solid part, rigging a large grooved wheel upon the top of the pile, passing an endless rope band around it, and round a pulley fixed 150 feet back; and then, by a number of men hauling upon the bank, a rotary motion was communicated to the pile, which screwed it down very fast. By these means, one bay of the pier, 17 feet long, was finished daily, even in very rough weather. The entire length of the jetty was 260 feet, its breadth 18 feet, with a cross-head 54 feet long, with landing-stages at each end, and two lines of railway throughout. The entire cost of this extension was 4,150*l.*, or about 47*l.* 10*s.* per lineal yard.

At a meeting on the 29th ult., various communications were received on the same subject, and were discussed at some length. Afterwards a paper was read, entitled "Remarks on the Formation of Entrances to Docks situated upon a Tide-way;" by Mr. J. B. Redman. After illustrating the subject by the example of the position and direction of all the principal dock entrances on the borders of the Thames in the port of London—shewing that the variations in the opinions and practices of engineers had been very great—it detailed the ordinary methods of docking and undocking ships, and the precautions to be taken in constructing entrances which should be best adapted for facilitating these operations; and although it was difficult to lay down any positive rules upon the subject, as the engineer must in almost every case be guided by local circumstances, in all ordinary cases the following general rules were recommended:—For graving docks, an angle of about 45 degrees, pointing up the stream; for wet docks, an angle of about 60 degrees, in the same direction; and a right angle with the stream for building ships. These, it was believed, would be generally found the most available.

THE PHILOSOPHY OF LABOUR.

In the week before last Elihu Burritt, the remarkable blacksmith of America, delivered a powerful address on this subject at Hull. After tracing the progress of man from the exercise of what he termed his primary faculties,—his hands and feet,—the speaker said:—The human mind has given to the world such embodiments of thought, that thousands have half worshipped the divinity that stirred within them, and even called the artist divine. It matters not whether he incarnated these godlike thoughts in canvas or marble, he breathed into the immortal image a living soul, a speaking mind, which will for ever remain behind to commune with the successive generations of men, when his name shall have perished. The Apollo Belvidere and Venus de Medicis are not petrifactions of thought, not posthumous images of a dead mind. No: their cold marble lips for centuries have uttered a voiceless language that has awed buried millions into reverence: they will hold the same sublime converse with millions yet unborn. Are these works divine? Let me point you to others of higher antiquity, of more direct divinity, a speaking statuary that conversed with Noah in the Ark, and all his descendants. Look at that axe, hammer, hoe, and spade. In their iron lips is a living speech, which has been audible to all ages and generations of men. They are things inspired with more divinity than all the marble statuary in the world: yes, and with humanity too, for they have worked for man as well as talked. Before sculpture had hollowed out a mortar to grind his corn, when the earth was one vast uncultivated wilderness, they went out and laboured with him in the field and forest, in the ditch and in the mountain: they helped him to get his food and feed his children, and make them a cover from the storm. They are the fathers of all statuary, painting, and architecture; and invested with just the more divine dignity than they, as they possess the more faculty to do for man: therefore, of all human works, those he has endowed with a kind of creative capacity, or a faculty for labouring for his comfort, are most entitled to the quality of divinity and the veneration of mankind: for they are not only his doing, but his faculty to do what he could not do before. Let us look in upon a man while engaged in the very act of adding to his natural strength these gigantic faculties. See him yonder bending over his stone mortar, and pounding, and thumping, and sweating to pulverise his flinty grain into a more esculent form. He stops and looks a moment into the precipitous torrent, thundering down its rocky channel. There, a thought has struck him. He begins to whistle; he whittles some timber, for he learned to whittle soon after he learned to breathe. He gears together, some horizontally, and others perpendicularly, a score of little wooden wheels. He sets them agoing, and claps his hands in triumph to see what they would do if a thousand times larger. Look at him again. How proudly he stands with folded arms, looking at the huge things that are working for him. He has made that wild raging torrent as tame as a horse. He has taught it to walk backward and forward; he has given it hands, and put the crank of his big wheel into them, and made it turn his ponderous grindstone! What a taskmaster! Look at him again. He is standing on the ocean beach watching the crested billows as they move in martial squadrons over the deep. He has conceived or heard that richer productions, more delicious fruits and flowers may be found on yonder invisible shore. In an instant his mind sympathises with the yearnings of his physical nature. See! there is a new thought in his eye. He remembers how he first saddled the horse; he now bits and saddles the mountain wave. Not satisfied with subduing this proud element, he breaks another into his service. Remembering his mill-dam, he constructs a floating dam of canvas in the air, to harness the wings to his ocean waggon. Thus, with his water-horse and air-horse harnessed in tandem, he drives across the wilderness of waters with a team that would make old Neptune hide his diminished head for envy, and sink his clumsy chariot beneath the waves. See, now he wants something else; his appetite for something better than he has grows upon what it feeds upon. The fact is, he has plodded about in his one-horse waggon, until he is disgusted with his poor capacity of locomotion. The wings of Mercury, modern eagles, and paper kites, are all too impracticable models. He settles down upon the persuasion that he can make a great iron horse, with bones of steel, and muscles of brass, that will run against time with Mercury, or any other winged messenger of Jove,—the daring man. He brings out his huge leviathan. Sets it upon the track. How the giant creature struts forth from his stable panting to be gone. His great heart is a furnace of glowing coals; his blood is boiling in his veins; the strength of a thousand horses is nerving his iron sinews. But his master reins him in with one finger, till the whole of some western village, men, women, children, and half their home and cattle, sheep, poultry, wheat, cheese, and potatoes, have been stowed away in that long train of waggons he has harnessed to his foaming steam-horse. And now he shouts interrogatively—"All right?" and applying a burning goad to the huge creature, away it thunders over the iron road, breathing forth fire and smoke in its indignant haste to outstrip the wind. To ameliorate our physical condition has been the inspiring object of every intellectual attainment. It has led to the discovery of every principle of natural philosophy and science; it has inspired every conception of taste, prompted every act of patriotism and Christian philanthropy. It was not to indulge a few mere intellectual abstractions that the ancient shepherds and sailors clambered up into the blue heavens and constellated the stars; they wanted them for guide-boards to guide them by night over the plains of the east and the unchartered waters of the ocean. If Phidias and Praxiteles were only bent on a mere diversion of the imagination, neither of them needed to have touched a chisel. The man who created the Apollo Belvidere looked into the mountain side, and saw the silver-

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